

**Hearing in the Matter of California Department of Water Resources  
and United States Bureau of Reclamation**

## Request for Change in Point of Diversion for California WaterFix

**Testimony of Ed Whitelaw on Behalf of C-WIN**

I, Ed Whitelaw, do hereby declare:

### I. INTRODUCTION

I am professor emeritus of economics at the University of Oregon, where I continue to teach in the economics department and the Clark Honors College. I received a Ph.D. in economics from the Massachusetts Institute of Technology in 1968 and a bachelors degree in mathematics, economics, and political science from the University of Montana in 1963. I founded ECONorthwest (ECONW) in 1974. ECONW provides analysis in economics, finance, planning, and policy evaluation to businesses and governments. I am now founder and president of FION. In 2016, FION subcontracted to ECONW on this matter. FION and ECONW continue to work closely together. I have over fifty years of experience in the practice and teaching of economics. One of my areas of professional focus is environmental and natural resource economics. I have testified on economic matters in administrative, legislative and Congressional hearings, before the NAFTA Tribunal, and in courts. Exhibit CWIN-200 contains a copy of my vita, which summarizes my qualifications.

### II. CONTEXT

Prodded by California's Code Section 794<sup>1</sup>, by the Board's<sup>2</sup> own standards for the public trust and the public interest,<sup>3</sup> and by scarce, high-quality water, the Board faces decisions on a very large estuarine ecological system<sup>4</sup>—the San Francisco estuary<sup>5</sup>—and a very large urban economic system —from roughly 100 miles north of Santa Barbara and south through San Diego.<sup>6</sup>

1 California Code of Regulations Title 23, Section 794

2 The State Water Resources Control Board (SWRCB)

3 <[https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/public\\_trust\\_resources/](https://www.waterboards.ca.gov/waterrights/water_issues/programs/public_trust_resources/)>

4 System, noun: *an assemblage or combination of things or parts forming a complex or unitary whole.* <<http://www.dictionary.com/browse/system?s=t>>

5 The Delta, the Bay and beyond

6 Officially, this system includes the Los Angeles-Long Beach-Riverside CA Combined Statistical Area, the Santa Barbara-Santa Maria-Goleta CA Metropolitan Statistical Area, and the San Diego-Carlsbad-San Marcos CA Metropolitan Statistical Area, with a combined 2011 population of nearly 22 million. In 2011, California's population was nearly 38 million. <[https://en.wikipedia.org/wiki/California\\_statistical\\_areas](https://en.wikipedia.org/wiki/California_statistical_areas)>

### III. CONTEXT OF MY ANALYSIS

#### A. CALIFORNIA'S PUBLIC TRUST: THE MONO LAKE DECISION (1983)

Had California, from Oregon to Mexico, had abundant, high-quality water available from, say, the 1950s to today, the National Audubon Society likely would not have filed its 1983 lawsuit<sup>7</sup> and we likely wouldn't be here today. California, however, has faced scarce, high-quality water throughout. But for California's Public Trust Doctrine, the state could more easily have paid no institutional attention to the reality behind the curtain. With it, though, California and the Board must pay attention.<sup>8</sup> And there's the challenge.

At the heart of California's Public Trust Doctrine lies the obligation of California on behalf of Californians in the long run to protect such public-trust resources<sup>9</sup> as instream flows and their concomitant ecological, habitat and recreational assets, functions, and services.<sup>10</sup>

<sup>11</sup> At the heart of the Board's challenge under California's Public Trust Doctrine in the matter at hand, is taking explicit account of the benefits forgone by failing to protect just such public-trust resources.<sup>12</sup> To date in this hearing, as I understand, the Board has not taken account of the benefits forgone. Not incidental, the value of benefits forgone is the definition of the economics term of art, "opportunity cost,"<sup>13</sup> an integral part of any credible economic evaluation of alternatives.

The California Supreme Court's 1983 Mono Lake decision<sup>14</sup> shows, among other things, the application of economics to the Board's specific responsibility to take account of the benefits forgone.<sup>15</sup>

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7 National Audubon Society v. Superior Court, 658 P.2d 709 (Cal. 1983)

8 ECONorthwest (2013), *Bay-Delta Water: Economics of Choice*, p.6; C-WIN Exhibit 205; ECONorthwest (2013), *The Economics of Public Trust*; C-WIN Exhibit 204

9 Frank, R. 2012. "The Public Trust Doctrine: Assessing Its Recent Past & Charting Its Future," *UC Davis Law Review*, Vol. 45: 665-691.

10 Stevens, J. 2005. "Protecting California's Rivers: Confluence of Science, Policy and Law. University of California at Davis, June 9, 2004. Applying the Public Trust Doctrine to River Protection." California Water Plan Update 2005 Volume 4: 393-400; Frank, 2012; Broussard, J. 1983. National Audubon Society et al., Petitioners, v. The Superior Court of Alpine County, Respondent; Department of Water and Power of the City of Los Angeles et al., Real Parties in Interest. 33 Cal.3d 419. S.F. No. 24368. Supreme Court of California. February 17.

11 ECONorthwest (2013), *Bay-Delta Water: Economics of Choice*, p.6; C-WIN Exhibit 205; ECONorthwest (2013), *The Economics of Public Trust*; C-WIN Exhibit 204

12 Stevens, 2005, page 397; California State Water Resources Control Board. 2015. Water Rights: Public Trust Resources. Last Updated October 28. Retrieved November 30, 2015, from [http://www.swrcb.ca.gov/waterrights/water\\_issues/programs/public\\_trust\\_resources/#beneficial](http://www.swrcb.ca.gov/waterrights/water_issues/programs/public_trust_resources/#beneficial).

13 Samuelson, PA and WD Nordhaus. 2010. *Microeconomics*, 19th ed. New York: McGraw-Hill Irwin, p.13. Dr. Samuelson, a Nobel laureate in economics and Institute Professor at MIT, died in 2009. Dr. Nordhaus is Sterling Professor of economics at Yale University.

14 <[https://en.wikipedia.org/wiki/National\\_Audubon\\_Society\\_v.\\_Superior\\_Court](https://en.wikipedia.org/wiki/National_Audubon_Society_v._Superior_Court)>

15 Loomis, J. 1998. "Estimating The Public's Values for Instream Flow: Economic Techniques and Dollar Values," *Journal of the American Water Resources Association*. Vol. 34, No. 6: 1007 – 1014. ECONorthwest (2013), *Bay-Delta Water: Economics of Choice*, p.6; C-WIN Exhibit 205; ECONorthwest (2013), *The Economics of Public Trust*; C-WIN Exhibit 204

## B. CALIFORNIA'S PUBLIC INTEREST: SANTA BARBARA AND WATERFIX

### 1. California's Public Interest: Santa Barbara

Santa Barbara County has recent experience with rushed water projects and large cost overruns. The regional drought of 1987-1992 induced calls for a Santa Barbara County Coastal Aqueduct project that promised to alleviate water shortages during droughts. Voters approved the ballot measure, which claimed the project would cost \$270 million and satisfy 97% of the contracted amount of water between the California Department of Water Resources (DWR) and the Central Coast Water Authority. The actual numbers were costs of \$1.76 billion that satisfied only 28% of the contracted amount of water. The agencies raised user rates to cover some cost overruns, but the unanticipated \$1.49 billion cost overrun has constrained water agencies financially. Santa Barbara's experience is a microcosm of the state. The experience Santa Barbara suffered with the Santa Barbara County Coastal Aqueduct and what the Petitioners propose with WaterFix seem starkly similar.<sup>16</sup>

### 2. California's Public Interest: WaterFix

Similar to the Coastal Aqueduct project, WaterFix planners' plan seems heroically though gratuitously optimistic. Evidence shows the Petitioners still need roughly \$920 million to finish the preliminary design phase.<sup>17</sup> The testimony from "John Bednarski, DWR Exhibit 57, a WaterFix engineer," shows that the project is still in the Conceptual Stage with no more than 10% of the project designed. The professional standard for construction is 70% designed, which will take an additional 3 years. The construction phase then will take at least 14 additional years to be constructed (17 years from now), assuming there are no further, unforeseen delays.<sup>18</sup> Under current WaterFix assumptions, costs will be between \$27.9-99.2 billion (2017 \$) when financing costs and uncertainty<sup>19</sup> regarding federal participation are considered.<sup>20</sup> Originally, federal contractors via federal agencies would have covered 45% of total costs. But now, apparently, these costs will be covered by state entities.

Uncertainty<sup>21</sup> engulfs the WaterFix project about what it will face underground, what effects the boring will have on the aboveground estuary, how to organize and operate seven massive boring machines at seven different locations, and which

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16 C-WIN Exhibit 210 p. 10

17 C-WIN Exhibit 210 p. 32

18 John Bednarski testimony, DWR 57, referencing "Conceptual Engineering Report, DWR 212.

19 See Frank Knight reference cited elsewhere.

20 ECONorthwest. California WaterFix: Potential Costs to Santa Barbara County. July 2016. Table 3, p. 5.

21 Not incidental, uncertainty and risk are not synonyms. As Frank Knight put it, "[Uncertainty] is something distinctly not of [risk's] character; and there are far-reaching and crucial differences [between the two]." In the matter at hand, this difference in kind and not in degree matters. Knight, F. H. 1921. *Risk, Uncertainty, and Profit*. Houghton Mifflin, Boston & New York. Pg. 19-20.

federal contractors are willing to do the work.<sup>22, 23</sup> Further, WaterFix proposes only to capture excess flows in wet years and does not plan expanding storage capacity.<sup>24</sup> This begs the question: How will water reliability increase, especially in dry years? It seems WaterFix will impose additional costs to agencies and ratepayers without offering compensating benefits. WaterFix seems compelled to channel Santa Barbara’s Aqueduct experience.

#### IV. ECONOMICS FOR CALIFORNIA’S PUBLIC TRUST AND PUBLIC INTEREST

In his 1858 *House Divided* speech, Lincoln both reflected on and anticipated the synopsis of policy analysis:

*If we could first know where we are, and whither we are tending,  
we could better judge what to do, and how to do it.*

The tenets of policy analysis follow easily from Lincoln’s insight:

**Table 1**

<b>Descriptive</b>	<b>Predictive</b>	<b>Explanatory</b>	<b>Normative</b>	<b>Prescriptive</b>
Where we are	Where we’re likely to be	Why we are where we are and likely to be	Where we’d like to be	How to get from where we are to where we’d like to be

In visiting University of Pennsylvania economist Walter Isard’s seminar at MIT in the mid-’60s, he lamented the lack of rigor in policy making. He opened with a modest and memorable line:

*Hunch and intuition with a little quantitative analysis  
is at least as good as hunch and intuition alone.*

As I’ve struggled with the meaning of public trust and public interest in these proceedings—and as the Board appears to be struggling as well—Isard’s plea resonates. His plea is one for increased rigor in the form of quantitative analysis, specific variables that one can measure, and, not at all incidental, the units of measurements. Adding economic analysis to the record in this hearing would leave the record at least as good as it is now. In my opinion, it would improve the record markedly.

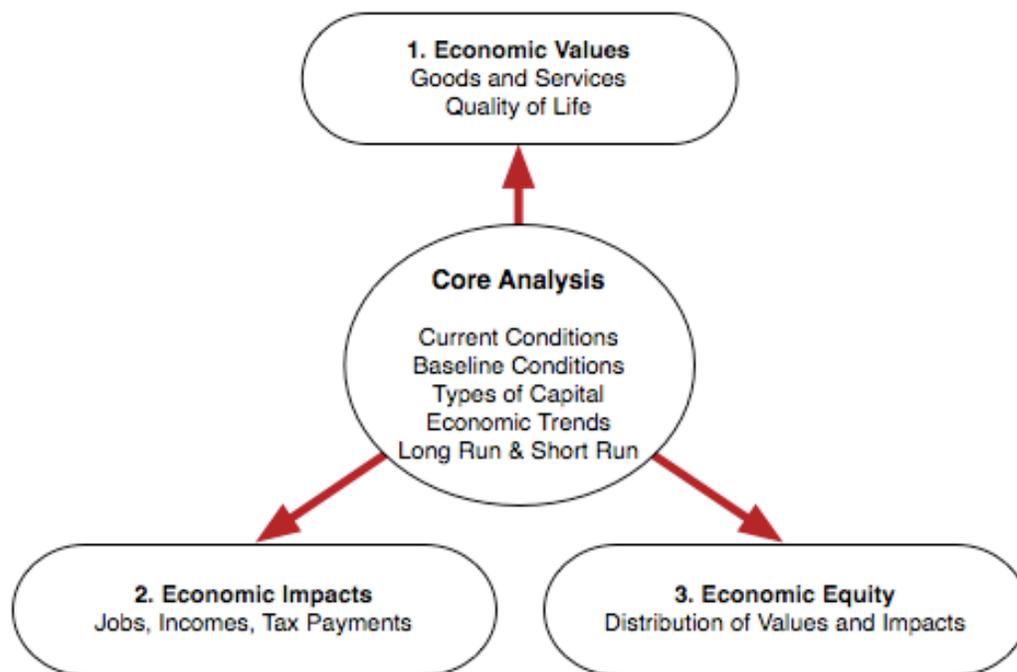
22 The experience of Seattle and a single boring machine, “Bertha,” over the course of traveling two miles in four years may be instructive here. See, for example, Lindblom, M. and D. Gutman. “The end is near for Bertha: After nearly 2 miles in 4 years, tunnel machine about to break through.” *The Seattle Times*. 03/31/2017. <<https://www.seattletimes.com/seattle-news/transportation/bertha-tunnel-boring-machine-highway-99-viaduct-replacement-south-lake-union>>

23 As I understand, there currently are no federal contractors willing to take on this contract.

24 C-WIN Exhibit 210 p. 39-40

Over the decades in which I've taught, consulted, and testified, I've cobbled together a simple framework for communicating the concepts and tools economists use for allocating scarce resources among competing demands. For the economics of the Board's decisions on public trust and the public interest, this framework offers rigor, clarity, and brevity. Nothing about its content is original. But my expression of it has proven useful. Figure 1 shows its most recent version.

**Figure 1: Categories of Economic Effects**



Source: ECONorthwest.<sup>25</sup>

Consider Table 2, which describes these three categories of the economic effects from both private and public actions and the core analysis common to all three.

**Table 2**

Economic Values	Economic Impacts		Economic Equity	
Changes in the values of both market and non-market goods and services	Changes in jobs and incomes for workers, costs and revenues for private firms, and taxes and expenditures for governments		Changes in the distributions of economic values and impacts across income brackets of households, across ethnicities, and across geographic areas	
Core Analysis				
Current Conditions	Baseline Conditions	Capital-Technology	Economic Trends	Short Run-Long Run

Source: FION

25 Cited also in ECONorthwest. 2013. "Bay-Delta Water: Economics of Choice" (C-WIN Exhibit 205); and ECONorthwest. 2013. "Critique of Substitute Environmental Document: In Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality" (C-WIN Exhibit 206)

While the contents of Figure 1 and Table 2 are duplicative, the differing formats help to contrast the separate purposes they can serve. While the figure serves well as an image for lay audiences off campus and lower division classes on campus, the table— more sophisticated versions of it—facilitates analysis. To illustrate the latter, I use three examples germane to the matter at hand.

For the first example, consider Current and Baseline Conditions. They refer, in order, to conditions as they are (“Descriptive” in Table 1) and as they should be (“Normative” in Table 1). The bigger the gap between them, the bigger the problem. The current conditions in this case are both the present and projected future water supply conditions in California. The Sacramento-San Joaquin Delta Reform Act of 2009 states that, “existing Delta policies are not sustainable. Resolving the crisis requires fundamental reorganization of the state’s management of Delta watershed resources.” More than two-thirds of the state’s residents and two million acres of farmland depend on Delta water. Current management practices have unreliably served these customers, increased estuary salinity, and depleted wetlands.<sup>26</sup> Others have been more explicit. Chris Shutes faults SWRCB’s current approach to Delta management, because, he finds, it inadequately considers the full range of current conditions and fails to plot a roadmap to reach the baseline conditions as laid out in the Delta Reform Act.<sup>27</sup> Bill Jennings also faults the Board because, as he finds, many fisheries have functionally collapsed since the SWRCB’s creation in 1967, highlighting the Board’s failure to protect public trust fisheries in the past and to arrest the declines in fish stock.<sup>28</sup> Barring a significant change to management practices,<sup>29</sup> these trends appear likely to continue.

The Baseline Conditions represent the best possible water supply scenario given the inherent uncertainty<sup>30</sup> of the environment and of markets. The Delta Reform Act also establishes the broad Baseline Conditions:

“[I]t is the intent of the Legislature to provide for the sustainable management of the Sacramento-San Joaquin Delta ecosystem, to provide for a more reliable water supply for the state, to protect and enhance the quality of water supply from the Delta, and to establish a governance structure that will direct efforts across state agencies to develop a legally enforceable Delta Plan.”<sup>31</sup>

The problem implied by the gap between the Current and Baseline Conditions is big and getting bigger. California will not see any evidence from the WaterFix experiment for another 17 or so years. From the second example below, this shoves California into waiting for nearly

26 [Sacramento-San Joaquin Delta Reform Act of 2009](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=200920107SB1) 28 Nov. 2017 <[https://leginfo.ca.gov/faces/billTextClient.xhtml?bill\\_id=200920107SB1](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=200920107SB1)>.

27 For a detailed description of SWRCB’s decision process and errors of omission, see Chris Shutes’ testimony, CSPA-202

28 For details regarding the decline of fisheries in the state, see Bill Jennings testimony, CSPA-200

29 See Chris Shute’s testimony, CSPA-202, for detailed policy recommendations.

30 As I’ve footnoted above, uncertainty and risk are not synonyms. As Frank Knight put it, “[Uncertainty] is something distinctly not of [risk’s] character; and there are far-reaching and crucial differences [between the two].” In the matter at hand, this difference in kind and not in degree matters. Knight, F. H. 1921. *Risk, Uncertainty, and Profit*. Houghton Mifflin, Boston & New York. Pg. 19-20.

31 [Sacramento-San Joaquin Delta Reform Act of 2009](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=200920107SB1) 28 Nov. 2017 <[https://leginfo.ca.gov/faces/billTextClient.xhtml?bill\\_id=200920107SB1](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=200920107SB1)>.

(or beyond) another generation, scuttling sustainability and jeopardizing other, short-run opportunities, e.g., efficient pricing of water.

For the second example using Table 2, consider both a) the four types of capital: human<sup>32</sup>, physical<sup>33</sup>, social<sup>34</sup>, and natural<sup>35</sup>, and b) lengths of time: short run and long run. By short run, economists mean 3 years and by long run they mean decades or generations.<sup>36</sup> And with capital, they refer to the capacity of an economy to make households well off in the long-run.<sup>37</sup> By describing these forms of capital—these assets—rigorously, California could measure the effects of the alternatives to the Twin Tunnels by measuring the annual flows of services from these assets. California could get partial, though indirect tests of the as yet untested and underfunded WaterFix hypothesis.

For the third example using Table 2, consider a) current and baseline conditions, b) social—especially institutions—and natural capital, and c) the long run. In their testimony Chris Shutes and Bill Jennings offer compelling observations on the gap between current and baseline conditions among the relevant institutions in this matter, including the Board. And changes in institutions almost invariably take a long time. The opportunity costs of delay are prohibitive.

Executed on this 29th day of November, 2017 at Eugene, Oregon.




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Ed Whitelaw

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32 “Stock of technical knowledge and skill embodied in a nation’s workforce, resulting from investments in formal education and on-the-job training.” Samuelson, P.A. and W.D. Nordhaus. 2005. *Economics*, 18th ed. New York: McGraw-Hill Irwin. p 740.

33 “those durable produced items that are in turn used as productive inputs for further production.” Samuelson, P.A. and W.D. Nordhaus. 2005. *Economics*, 18th ed. New York: McGraw-Hill Irwin. p 267

34 “The institutions, relationships, and norms that shape the quality and quantity of a society’s social interactions.” World Bank 1999 <<http://www.worldbank.org/en/webarchives/archive?url=httpzxxxweb.worldbank.org/archive/website00996A/WEB/OTHER/COMMUNIT.HTM&mdk=21600690>>

35 The “endowment of environmental and natural resources.” Teitenberg, T. and Lewis, L. 2015. *Environmental & Natural Resource Economics*. 10th ed. New Jersey: Pearson. p. 570.

36 Blanchard, O. and D. Johnson. *Macroeconomics*. 2017, pp. 35-36

37 Solow, Robert M. “A contribution to the theory of economic growth.” *The quarterly journal of economics* 70.1 (1956): 65-94.